Environmental advantages of composite fuels based on industrial wastes and different ranks of coal

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Thermal power plants and boiler units generate most of the anthropogenic emissions around the world. This is especially true for the industrialized and industrializing economies (China, India, the USA, the European Union, and Russia). Solid fuels are regarded as the most hazardous of all the primary energy sources (coal, gas, fuel oil, and petroleum) in terms of anthropogenic emissions. Countries with advanced coal-based heat and power industries are the ones contributing the most to the problem of global warming. A promising solution to many problems that heat and power industry is facing today would be switching from conventional coal dust combustion to composite liquid fuels (CLF). These are also known as coal-water slurries containing petrochemicals (CWSP). Here, we perform an experimental study of the most hazardous anthropogenic emissions (sulfur and nitrogen oxides) from the combustion of high-potential CWSP. We identify the main benefits and potential drawbacks of using CWSP in heat and power industry. A set of components and additives to CWSP are explored that significantly affect the environmental and energy performance of fuels. The anthropogenic emissions from the combustion of CWSP made of widespread coal and oil processing wastes are no higher than those from coal dust combustion. Using specialized additives to CWSP, we can change the concentrations of NO_x and SO_x several times. The most appealing additives to CWSP are sawdust, straw, charcoal, limestone, and glycerol. They provide better environmental, economic, and energy performance and improve the rheological properties of CWSP. Used oils and oil sludge added to CWSP may impair the environmental performance but boost the cost and energy efficiency. Using coal-water slurries containing petrochemicals as a fuel at heat and power plants is an environmentally friendly as well as cost- and energy-efficient way to recover industrial wastes. It generates energy and mitigates the negative impact of coal-based heat and power industry on the environment.